WHAT IS CLAIMED IS:

1. A nucleic acid enzyme having a sensor site and a cleavage active site, wherein the nucleic acid enzyme exhibits a cleavage activity towards a target RNA only when the target RNA binds to the cleavage active site while an RNA, DNA or protein different from the target RNA binds to the sensor site.

2. The nucleic acid enzyme according to claim 1, having a dimeric structure which is formed from an RNA molecule comprising nucleotide sequence (10) below, and an RNA molecule comprising nucleotide sequence (20) below:

$$5'X^1_1 \cdots X^1_h Y^1_1 \cdots Y^1_i Z^1_1 \cdots Z^1_j 3' \quad (10); \text{ and}$$

$$5'Z^2_1 \cdots Z^2_n Y^2_1 \cdots Y^2_m X^2_1 \cdots X^2_k 3' \quad (20),$$

wherein X^1_1 to X^1_h, X^2_1 to X^2_k, Y^1_1 to Y^1_i, Y^2_1 to Y^2_m, Z^1_1 to Z^1_j and Z^2_1 to Z^2_n are each independently any one of A, U, T, C or G,

h and k are each an integer of 1 or greater,

i and m are each an integer of 1 or greater,

j is an integer of 1 or greater,

n is an integer of 1 or greater,

$X^1_1 \cdots X^1_h$ and $X^2_1 \cdots X^2_k$ are nucleotide sequences capable of forming a sensor site,

$Y^1_1 \cdots Y^1_i$ and $Y^2_1 \cdots Y^2_m$ are nucleotide sequences capable of forming a stem, comprising regions which are able to form a cavity to stably capture a Mg^{2+} ion only when said RNA, DNA or protein binds to a sensor site, and

$Z^1_1 \cdots Z^1_j$ and $Z^2_1 \cdots Z^2_n$ are nucleotide sequences comprising regions complementary to target RNA sequences adjacent to a target RNA cleavage site.

3. The nucleic acid enzyme according to claim 1, wherein the target RNA is an mRNA encoding a protein essential for the survival of a cell.

4. The nucleic acid enzyme according to claim 1, wherein the target RNA is an

mRNA encoding a protein which prevents apoptosis, such as bcl-2 protein.

5. The nucleic acid enzyme according to claim 1, wherein the target RNA is a viral RNA, or an mRNA encoding a protein associated with a disease such as cancer.

6. The nucleic acid enzyme according to claim 1, wherein the RNA molecule that binds to the sensor site is an mRNA encoding a disease-associated protein.

7. The nucleic acid molecule according to claim 1, wherein the RNA molecule that binds with the sensor site is a tissue-specifically or time-specifically expressing mRNA, or an RNA artificially introduced for the purpose of regulating a nucleic acid enzyme activity.

8. The nucleic acid enzyme according to claim 5 or 6, wherein the mRNA encoding a disease-associated protein is an mRNA derived from a oncocyte marker, or virus-derived RNA such as HIV tat mRNA.

9. The nucleic acid enzyme according to claim 1, having a dimeric structure which is formed from an RNA molecule comprising nucleotide sequence (1) below and an RNA molecule comprising nucleotide sequence (2) below :

5' GGUCCUGGCC UGAUGAGAGU GAUGAGCUCU UC 3' (1) (SEQ ID NO:1); and

5' GUCUGACUGU UCAUCGAAAC CGGGUCC 3' (2) (SEQ ID NO:2),

wherein nucleotide Nos. 1 to 9 of nucleotide sequence (1) and nucleotide Nos. 19 to 27 of nucleotide sequence (2) may or may not be modified such that they are complementary to a target RNA sequence adjacent to a target RNA cleavage site, and wherein nucleotide Nos. 20 to 32 of nucleotide sequence (1) and nucleotide Nos. 1 to 12 of nucleotide sequence (2) may or may not be modified such that they are

complementary to a sequence within another mRNA specific to an AIDS-causing virus, HIV-1, or to a sequence of another site within tat mRNA of HIV-1.

10. The nucleic acid enzyme according to claim 5 or 6, wherein the mRNA encoding a disease-associated protein is a chronic myelocytic leukemia-derived BCR-ABL mRNA.

11. The nucleic acid enzyme according to claim 1, having a dimeric structure formed by an RNA molecule comprising nucleotide sequence (3) below and an RNA molecule comprising nucleotide sequence (4) below:

5' GGUCCUGGCC UGAUGAGAGU UAUUGAUGGU CAG 3' (3) (SEQ ID NO:3); and

5' GAAGGGCUUC UUUCAUCGAA ACCGGGUCC 3' (4) (SEQ ID NO:4),

wherein nucleotide Nos. 1 to 9 of nucleotide sequence (3) and nucleotide numbers 20 to 29 of nucleotide sequence (4) may or may not be modified such that they are complementary to a target RNA sequence adjacent to a target RNA cleavage site, and wherein nucleotide Nos. 20 to 33 of nucleotide sequence (3) and nucleotide Nos. 1 to 14 of nucleotide sequence (4) may or may not be modified such that they are complimentary to a sequence within another mRNA specific to chronic myelocytic leukemia or a sequence of another site within BCR-ABL mRNA.

12. The nucleic acid enzyme according to claim 1, wherein a linker sequence, a $tRNA^{Val}$ promoter sequence, or both, is added upstream of the nucleic acid enzyme sequence.

13. The nucleic acid enzyme according to claim 1, wherein a pol II promoter sequence or pol III promoter sequence is added upstream of the nucleic acid enzyme sequence.

14. The nucleic acid enzyme according to claim 12, which comprises nucleotide sequence (5) or nucleotide sequence (6) below:

5' AAA 3' (5); and

5' UUU 3' (6).

15. The nucleic acid enzyme according to claim 12, wherein the $tRNA^{Val}$ promoter sequence comprises nucleotide sequence (7) below:

5' ACCGUUGGUU UCCGUAGUGU AGUGGUUAUC ACGUUCGCCU AACACGCGAA AGGUCCCCGG UUCGAAACCG GGCACUACAA AAACCAAC 3' (7) (SEQ ID NO:5).

16. The nucleic acid enzyme according to claim 1, wherein a delivery agent is attached to the nucleic acid enzyme sequence

17. The nucleic acid enzyme according to claim 16, wherein the delivery agent is selected from the group consisting of peptides, peptide mimics, virus-derived proteins, cholesterols, steroids, cholesterol derivatives, fats, vitamins, biotin, folic acid, retinoic acid, proteins, ferritin, LDL, insulin, antibodies, saccharides or oligosaccharides, polyethylene glycol, or homopolymers or copolymers of amino acids.

18. The nucleic acid enzyme according to claim 1, wherein an additional sequence, terminator sequence, or both, is added downstream of the nucleic acid enzyme sequence.

19. The nucleic acid enzyme according to claim 18, wherein the additional sequence comprises any one of nucleotide sequences (8) to (10) below:

5' AAA 3' (8);

5' AACCGUA 3' (9); and

5' UUUUU 3' (10).

20. An expression vector comprising DNA encoding the nucleic acid enzyme according to claim 1.

21. A method of producing a nucleic acid enzyme, wherein the method comprises transcribing into RNA using, as a template, an expression vector DNA comprising DNA encoding the nucleic acid enzyme according to claim 1.

22. A gene transfer vehicle comprising the nucleic acid enzyme according to claim 1.

23. The gene transfer vehicle according to claim 22, which is in the form of a positively charged liposome.

24. A pharmaceutical composition comprising, as an active ingredient, the nucleic acid enzyme according to claim 1, the expression vector according to claim 20, or the vehicle of claim 22.

25. The pharmaceutical composition according to claim 24, for use in prevention and/or treatment of a disease caused by a target DNA.

26. The pharmaceutical composition according to claim 24 for controlling or inhibiting expression of disease-causing abnormal mRNA by allowing the nucleic acid enzyme according to claim 1 to express within an organism.

27. A method of specifically cleaving a target RNA using the nucleic acid enzyme

according to claim 1.

28. The method according to claim 27, wherein the target RNA is an abnormal mRNA which causes a disease.

29. A host cell comprising the nucleic acid enzyme according to claim 1, the host cell being selected from the group consisting of prokaryote cells such as *E. coli*, and eukaryotic cells such as human cells, mammalian cells, plant cells and yeast cells.

30. A diagnostic agent comprising the nucleic acid enzyme according to claim 1.